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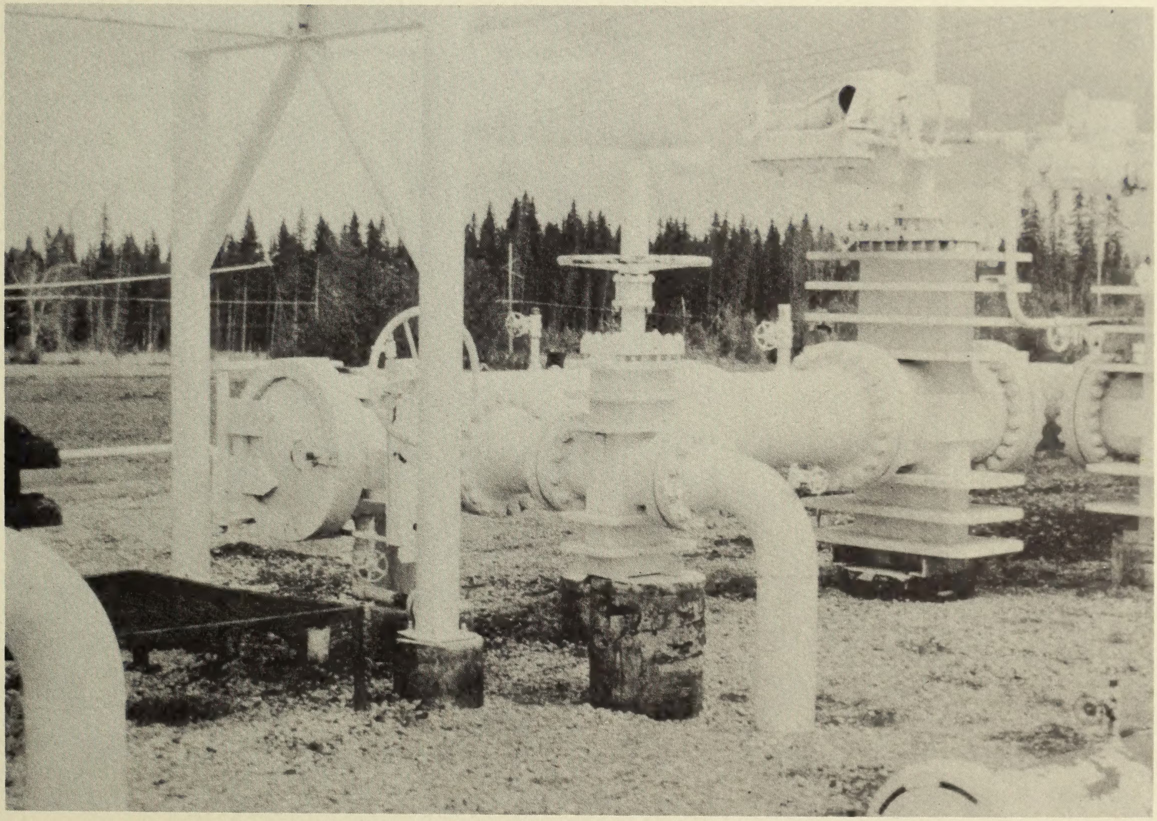
Pipeline Performance in Alberta



Pipeline Performance in Alberta

ENERGY RESOURCES CONSERVATION BOARD
PIPELINE PERFORMANCE IN ALBERTA

DECEMBER 1991

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PREFACE

In 1983 the Energy Resources Conservation Board (ERCB) published a report entitled *An Analysis of Pipeline Performance in Alberta* (D 83-G). It was the first report published by the ERCB detailing the information collected on pipeline failures in Alberta under ERCB jurisdiction. This 1991 edition of *Pipeline Performance in Alberta* (91-G) updates and expands on the information contained in the previous report, and an additional section provides more information on water pipeline failures.

The report is available to interested parties through the ERCB's Information Services,
640 Fifth Avenue SW, Calgary, Alberta, T2P 3G4, Telephone (403) 297-8311, or FAX
(403) 297-7040.

Inquiries regarding the report should be directed to the ERCB Pipeline Department at (403) 297-8366.

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EXECUTIVE SUMMARY

Pipeline performance is examined through the analysis of the causes and magnitude of pipeline failures, and the failure rate in terms of length of pipeline.

As of January 1991, there were approximately 208 000 kilometres of pipelines under ERCB jurisdiction.

About 60 per cent of this total length is used to transport natural gas. Approximately 70 per cent of the length consists of pipelines of less than 150 millimetres outside diameter (NPS 6).

The reporting of any pipeline failures by the operating companies to the ERCB is mandatory without limitation of cause, magnitude, or consequences. A **pipeline failure** is defined for the purpose of this report as the failure of a pipeline to contain the fluid being transported. A leak is a small opening or crack in the pipeline causing some fluid loss, but not immediately impairing the operation of the line. A rupture is a major pipe opening caused by the instantaneous tearing or fracturing of pipe material, immediately impairing operation of the pipeline.

Records of reported pipeline failures have been kept by the ERCB since 1975. On average there have been 600 failures per year from 1975 to 1991.

Major features of the data are:

- There are 4.5 times as many leaks as ruptures.
- Seventy-five per cent of all failures occur on water and multiphase lines, which form the major portion of the upstream or production pipeline infrastructure of the industry.
- Failure rates per unit length are relatively constant except the rates for water and multiphase lines which show an upward trend.
- Corrosion is by far the leading cause of leaks.
- Third-party damage is the greatest cause of ruptures.
- Sour gas and high-vapour pressure (HVP) products pipelines have lowest number of failures.
- The majority of spills of liquids from failures are less than 5 cubic metres in volume.

The report describes the source of the data and methods of reporting, and contains a summary of failure causes and failure frequencies in terms of length of pipeline.

DEFINITIONS USED IN THIS REPORT

Abandonment — permanent deactivation of a pipeline or part of a pipeline, which may include the removal of the pipeline.

Butanes — in addition to its normal scientific meaning, a mixture mainly of butanes which ordinarily may contain some propane or pentanes plus.

Construction Damage — damage caused by defective construction techniques such as dents and scrapes by mechanical devices, disbonding of internal coatings, external coatings improperly applied during construction, failure due to settling of pipe (improper backfill), and failure at bends due to construction practices, but excluding damage by others during construction.

Crude Oil — a mixture mainly of pentanes and heavier hydrocarbons that may be contaminated with sulphur compounds, that is recovered or is recoverable at a well from an underground reservoir, and that is liquid at the conditions under which its volume is measured or estimated.

Discontinue — to temporarily deactivate a pipeline or part of a pipeline.

Earth Movement — a change in pipe ground support resulting from such causes as river changes, frost heaves, and slumping.

Ethane — in addition to its normal scientific meaning, a mixture mainly of ethane which ordinarily may contain some methane or propane.

Failure — the inability of the pipeline to contain the fluid being transported.

Girth Weld Failure — a metal failure in the weld metal or heat-affected zone of circumferential weld.

Ground Disturbance — defined in the Pipeline Act as any work, operation or activity that results in a disturbance of the earth including, without limitation, excavating, digging, trenching, ploughing, drilling, tunnelling, auguring, backfilling, blasting, topsoil stripping, land levelling, peat removing, quarrying, clearing, or grading.

HVP (high-vapour pressure) — any product which produces a vapour pressure in excess of 340 kilopascals absolute at 38°C.

Installation Failure — a failure at a compressor station, pumping station, or meter station.

Leak — a small opening, crack, or hole in the pipeline causing some product loss, but not immediately impairing the operation of the line.

Mechanical Joint Failure — a failure of a joint such as screwed couplings.

Miscellaneous Failure — a failure resulting from erosion, rock damage, vandalism, lightning strikes, or flooding from rivers.

Miscellaneous Joint Failures — failures of other than mechanical or welded joints, such as plastic butt fusion, socket fusion, or fibreglass bonding.

Multiphase — oil well effluent consisting of more than one fluid, such as oil, water, and gas.

Natural Gas — mixture of hydrocarbon and non-hydrocarbon gases, possibly in combination with liquid petroleum condensates and water.

Other Weld Failures — weld failures other than girth or seam weld failure, such as weldolet or branch connections.

Overpressure Failure — a failure caused by such events as frozen lines, waxed off lines, pig stuck in line, hydrate plug, switch failure, or thermal overpressure.

Pipe Failure — a failure of the pipe body due to metallurgical anomalies; also includes failure of plastic pipe; examples are lamination separations, brittle and running cracks.

Pipeline — a pipe used to convey a substance or combination of substances, including installations associated with the pipe.

Propane — in addition to its normal scientific meaning, a mixture mainly of propane which ordinarily may contain some ethane or butanes.

Rupture — the instantaneous tearing or fracturing of pipe material, immediately impairing the operation of the pipeline.

Seam Ruptures — failures resulting from the opening of the longitudinal weld, including those caused by vibration, but not including failures due to overpressurization.

Sour Multiphase — defined in the Canadian Standards Association CAN/CSA-Z183-M90, Section 4.4.1.

Sour Natural Gas — natural gas containing greater than 10 moles of hydrogen sulphide (H_2S) per kilomole of natural gas.

Third-party Damage — damage to a pipeline after construction caused by ground disturbance activities.

Valve or Fitting Failures — failures of a valve or fitting such as gasket blowouts, or pig trap failures.

Water: fresh — potable water, usually river, lake, or well water
salt — any water other than potable.

PART A

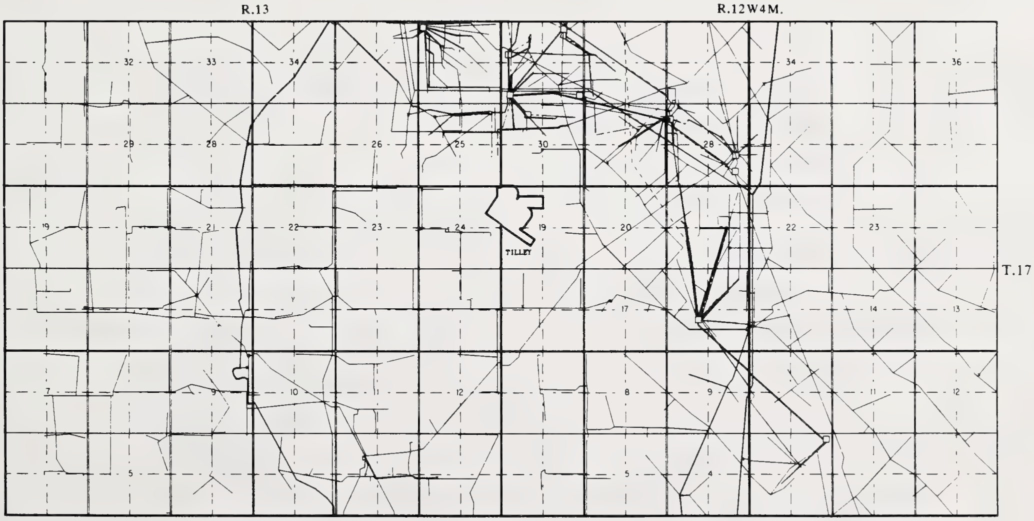
PIPELINE PERFORMANCE

INTRODUCTION

All energy-related intraprovincial pipelines in Alberta, which include all pipelines in Alberta except

- natural gas distribution pipelines operating at less than 700 kPa,
- pipelines contained within a refinery or processing plant,
- pipelines under the jurisdiction of the National Energy Board,
- pressure piping within the meaning of the Boilers and Pressure Vessels Act, and
- pipelines used to convey water other than those connected to a facility authorized under the Oil and Gas Conservation Act or the Oil Sands Conservation Act,

fall under the jurisdiction of the ERCB. The Pipeline Act requires all operators to report any pipeline failure to the ERCB, and the ERCB collects information on all pipeline failures in Alberta under its jurisdiction without limitation of cause, magnitude, or consequence. A pipeline failure is defined for the purposes of this report as the inability of the pipeline to contain the fluid being transported.



Typical Oilfield Gathering System

1 The Pipeline Failure Database

Information is collected on all pipeline failures independently of product transported and pipeline material. The information compiled on each failure includes date of occurrence, geographic location, pipeline specifications, general operating conditions, and one of eighteen cause categories shown in Table 1.

When a pipeline failure occurs the operator informs the ERCB field office and an ERCB inspector completes a report. A sample reporting form (F4) is given in Appendix A. The report is then forwarded to the main office in Calgary for permanent storage and subsequent analysis. The information on pipeline failures has been recorded on a computer-assisted record system since 1975. There may be some minor differences in the data presented in the 1983 and 1991 versions of this report because of ongoing auditing of the data.

The product volumes spilled because of failure are usually estimated on site and, consequently, the use of these data for performance evaluation is limited. Records of near misses or damage to a pipeline which do not result in a discharge or product are not entered into the database. Pressure test failures on pipelines which have not been in service are also excluded from the system. Failures during requalification pressure testing are included, and if multiple pipeline failures occur during a retest, each is recorded separately. As retest failures usually occur under controlled conditions at higher than operating pressures and with fresh water in the pipe, they are excluded from the general analysis.

TABLE 1 PIPELINE FAILURE CAUSE CATEGORIES

Corrosion:	- Internal Corrosion - Corrosion at Girth or Fillet Weld - External Corrosion
External Forces:	- Construction Damage - Damage by Others (third-party damage) - Earth Movement
Joints:	- Mechanical Joints - Miscellaneous
Weld:	- Girth Weld - Other Welds - Seam Rupture
Equipment:	- Installation - Valve/Fitting Failure
Others:	- Pipe (breaks in the pipe body) - Overpressure - Operator Error - Miscellaneous - Unknown

For the purpose of this report pipelines are grouped into seven substance categories: crude oil, HVP products, multiphase, natural gas, sour natural gas, water, and others. A number of substances are grouped together because of similar characteristics. Salt water and fresh water pipelines are grouped together to form the category "water pipelines". Sweet and sour multiphase and sweet and sour crude oil are grouped together to form the "multiphase" and "crude oil" categories respectively. A release of propane, butanes, or ethane, is considered an HVP products pipeline failure. The "other" category includes pipelines that carry products such as diesel fuel, synthetic crude oil, or steam. Sour gas is defined as natural gas containing greater than 10 moles of H_2S per kilomole of natural gas and should not be confused with "sour service" defined in CAN/CSA-Z184-M86.

In some of the figures which follow, the HVP category does not appear because of the very low failure numbers (less than 20 in 11 years) or because of the difficulty with the length statistic described in Section 2.

2 Length of Pipelines

There were approximately 208 000 kilometres (km) of licensed pipelines in Alberta under ERCB jurisdiction as of January 1991. This total includes pipelines which are discontinued or abandoned. The lengths are classified according to substance. If a pipeline transports more than one substance the length is allocated to the substance of highest priority according to the order listed in Table 2.

The length of a pipeline batching propane and crude oil would be allocated to the HVP category.

The approximate breakdown of pipeline lengths according to substance transported is given in Table 3 showing the growth from 1983 to 1990.

In 1982 changes to the substance definitions were made to better classify them and to accommodate computerization of the database. This reclas-sification caused some inaccuracies. Further inaccuracies result from the fact that until

TABLE 2 ORDER OF SUBSTANCE PRIORITY

Priority	Substance	Priority	Substance
1	sour natural gas	7	fuel gas
2	HVP products	8	salt water
3	crude oil	9	miscellaneous liquids
4	oil well effluent, multiphase	10	miscellaneous gases
5	low-vapour-pressure products	11	fresh water
6	natural gas		

1986 HVP pipelines were not listed separately, but were included with crude oil or water pipelines (which was a catch-all category in those days). The development of tertiary recovery techniques in the early '80s spurred the more accurate recording of HVP lengths and from other sources the current length has been estimated at about 6500 km. The growth rate for HVP pipelines is therefore unavailable and failure-rate trends of HVP pipelines cannot be calculated.

The absolute numbers quoted in the table should therefore be treated as reasonable approximations, but sufficiently accurate to identify trends.

3 Annual Pipeline Failures Categorized by Substance Transported

Figure 1 shows the failure record for 11 years of the different substances transported. The failures include those occurring when a pipeline is under a pressure retest following a repair or maintenance. These retest failures are allocated to the substance licensed to be carried, even though most pressure tests are conducted with water. These figures therefore give an exaggerated picture of the failures.

Figure 2 shows the failure record of operational pipelines and gives a more realistic picture of the failure history. Operational failures are classified according to the substance which escapes, so that if a pipeline is batching products, only one of the products would be counted.

The figure shows an upward trend in the number of failures, and that over the last 5 years there are about 700 annually. By far the great majority of these failures are on water and multiphase lines, which are usually small diameter pipelines. The upward trend should be viewed in the light of the increasing length of operating pipelines (see Section 5 on frequency of failures).

TABLE 3 LENGTH OF PIPELINES IN ALBERTA UNDER ERCB JURISDICTION

Type of Pipeline Cumulative Length (km)

	1983	1984	1985	1986	1987	1988	1989	1990
Crude Oil	22 700	23 200	24 900	25 600	26 100	26 400	26 800	27 100
Natural Gas	95 500	105 000	106 000	110 200	113 400	117 000	120 800	125 500
Sour Gas	3 000	3 500	4 000	4 400	4 600	5 100	5 400	5 700
Water	12 900	13 500	14 300	15 000	15 600	16 000	16 400	16 700
Multiphase	19 700	22 500	24 400	26 000	27 300	28 800	30 300	31 500
Others*				600	1 000	1 300	1 600	1 700
Total	153 800	163 200	173 600	181 800	188 000	194 600	201 300	208 200

* The "Others" category for 1983 through 1986 was grouped with the water lines.

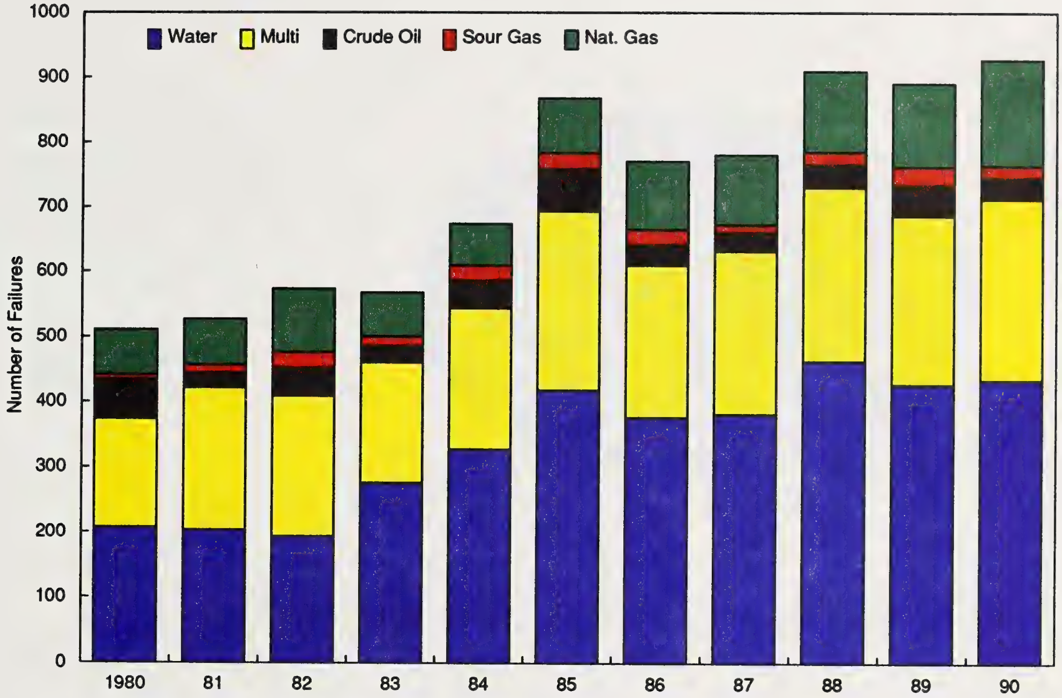


FIGURE 1 ANNUAL PIPELINE FAILURES (Including Pressure Retesting Failures)

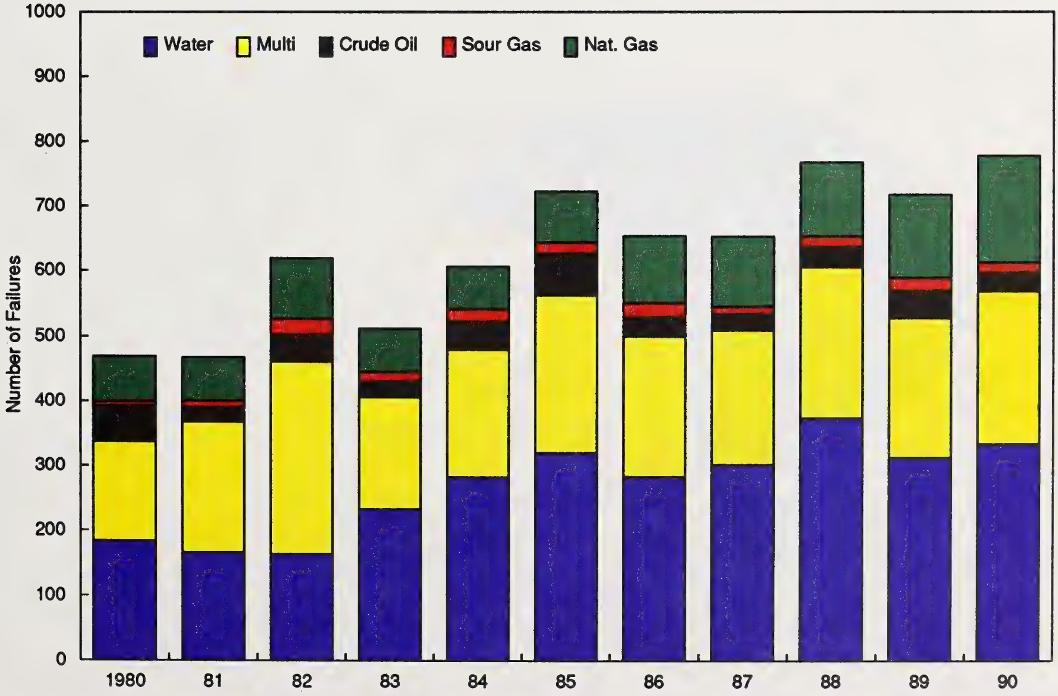


FIGURE 2 OPERATIONAL PIPELINE FAILURES

4 Failures Categorized by Cause

Figure 3 shows the percentage distribution of failure causes for all pipelines for the 11-year period from 1980 to 1990. It shows that about 60 per cent of all failures are caused by corrosion, the next highest proportion being third-party damage at 10 per cent.

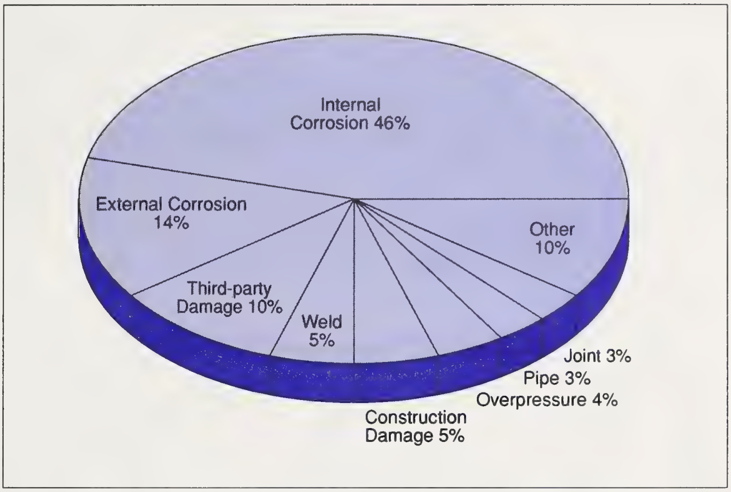


FIGURE 3 DISTRIBUTION OF FAILURE By Cause (Per Cent)

Figure 4 shows the cause breakdown of five of six substances. This figure indicates that corrosion causes most failures in pipelines carrying the more aggressive fluids, such as multiphase oil, produced water, and sour gas.

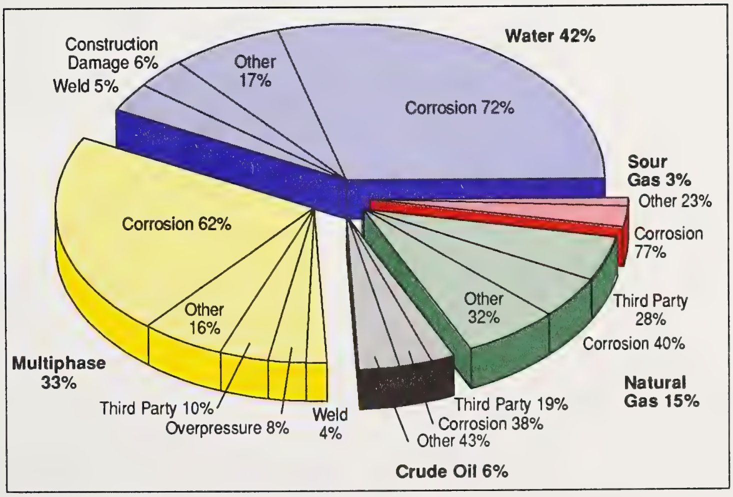


FIGURE 4 MAIN CAUSES OF PIPELINE FAILURES By Pipeline Type (Per Cent)

Figure 5 shows the trend by year of the various causes of failure. Of note is the rise in the number of failures due to internal corrosion.

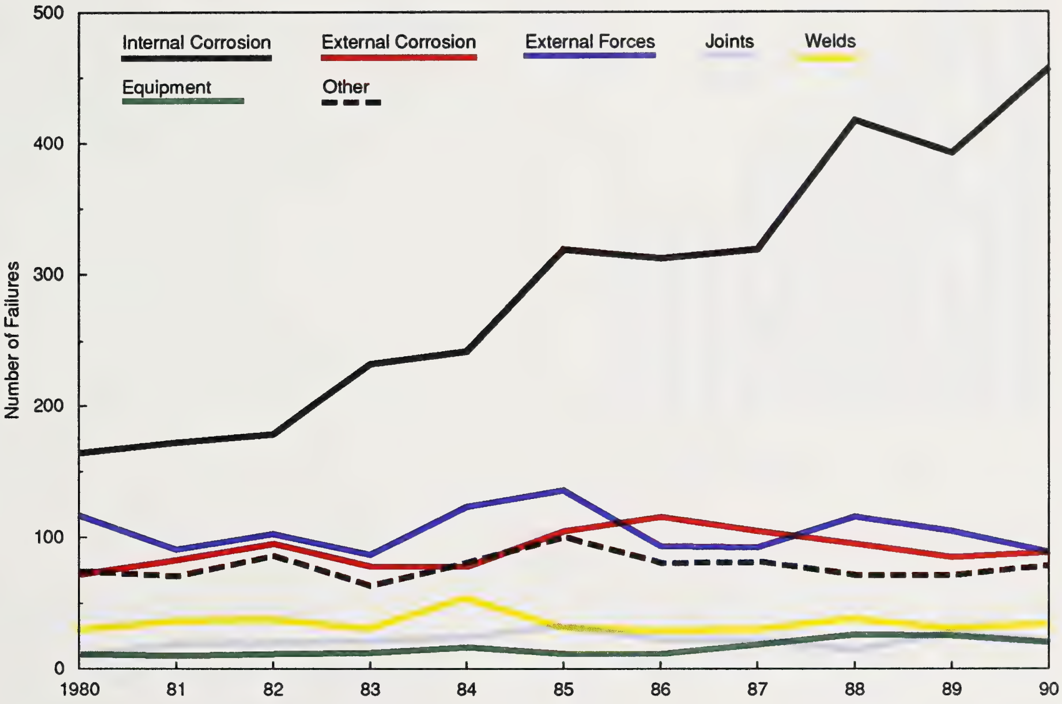


FIGURE 5 ANNUAL PIPELINE FAILURES
By Cause

Figures 6 to 11 show the distribution of causes of failures for individual categories of operating pipelines for the years 1980 to 1990.

Figure 6 Water Pipelines

The figure shows that the main cause of failure is corrosion, and that corrosion failures have been increasing relative to other types of failure. A more detailed review of water pipelines is included in Section B of this report.

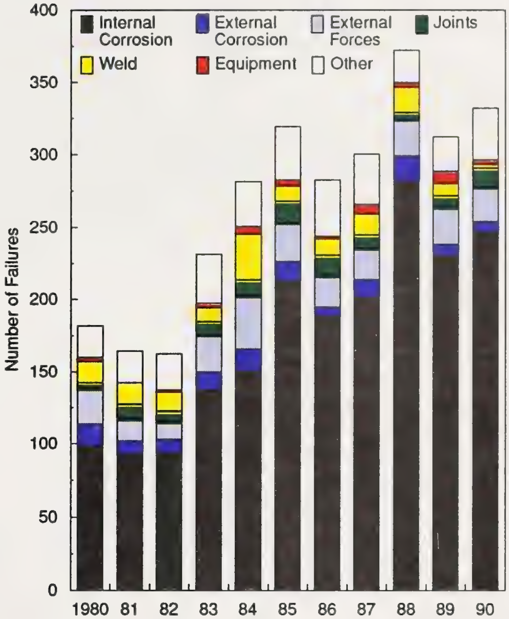


FIGURE 6 ANNUAL WATER PIPELINE FAILURES
By Cause

Figure 7 Multiphase Pipelines

The main cause of failure is corrosion, accounting for about 60 per cent, showing an increase relative to other types of failure. In the early 1980s corrosion failures were divided almost equally between internal and external corrosion, but the number of internal corrosion failures shows an increasing trend in the later years.

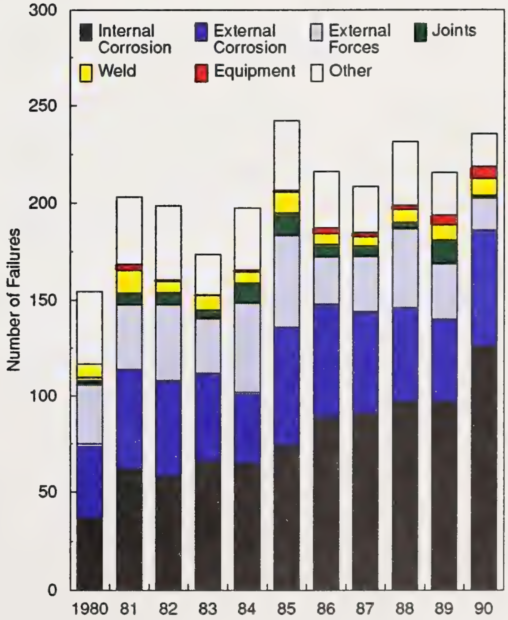


FIGURE 7 ANNUAL MULTIPHASE PIPELINE FAILURES
By Cause

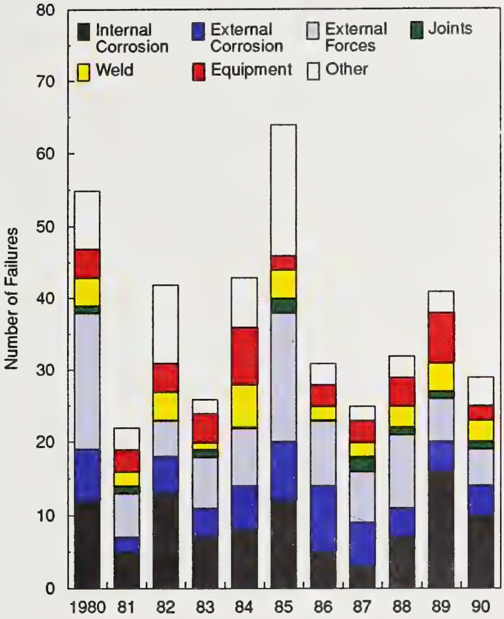


FIGURE 8 ANNUAL CRUDE OIL PIPELINE FAILURES
By Cause

Figure 8 Crude Oil Pipelines

Although corrosion is the major cause, at about 25 per cent of all failures, there is a more random distribution of failure causes than with water and multiphase. External forces play a more prominent role.

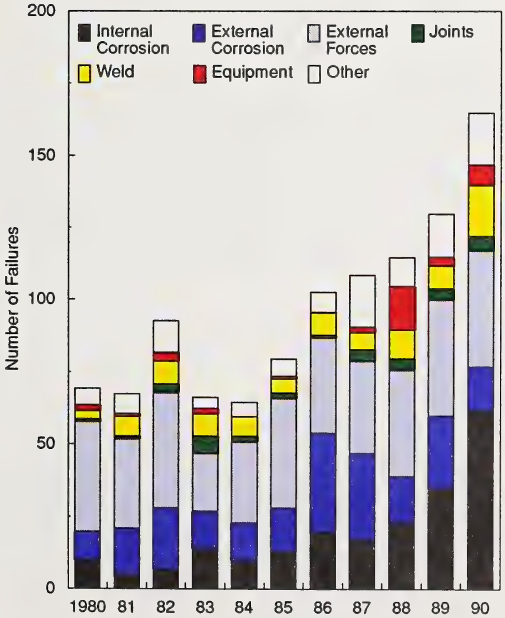


FIGURE 9 ANNUAL NATURAL GAS PIPELINE FAILURES
By Cause

Figure 9 Natural Gas Pipelines

Natural gas pipelines account for over half the length of all pipelines in Alberta. The natural gas category includes pipelines from wellhead to customer. It includes natural gas with less than 10 mol H_2S/kmol gas.

External forces cause a consistently significant proportion of failures. There is a growing number of internal corrosion failures.

Figure 10 Sour Natural Gas Pipelines

The number of failures is low and the failures are mainly corrosion related. In view of the potential adverse impact on the public associated with a sour gas release, operators undertake extensive corrosion mitigation and monitoring programs as preventative action. The use of internal inspection tools has become standard procedure for many in the operation and maintenance of the systems. There have been very few equipment and joint failures, probably because of the stringent design and operating requirements for sour gas lines.

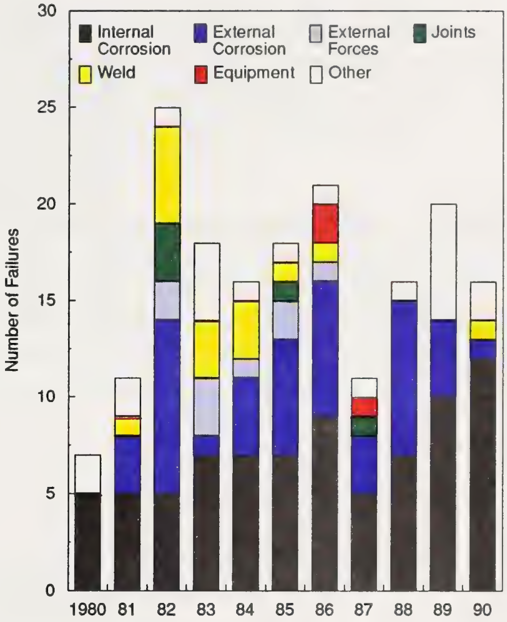


FIGURE 10 ANNUAL SOUR GAS PIPELINE FAILURES By Cause

Figure 11 HVP Products Pipelines

HVP pipeline failures are rare. The main single cause of failure is external forces. Other causes appear randomly distributed. In view of the potential adverse impacts on the public of an HVP release, operators take great care with operation and maintenance of these lines.

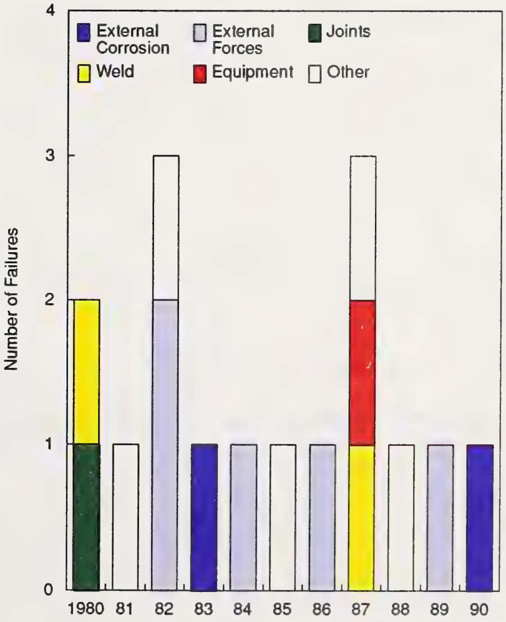


FIGURE 11 ANNUAL HVP PIPELINE FAILURES By Cause

5 Frequency of Pipeline Failures

The previous sections have indicated that there is in most categories an apparent upward trend in the numbers of failures. This trend must be viewed in the light of the increasing length of the pipeline infrastructure.

Figure 12 shows the annual failures per 1000 km of five categories of pipeline for the years 1983 to 1990. Each point on the trend line is obtained by dividing the number of failures in that particular year by the number of thousands of kilometres of that particular category of pipeline in the ground at that time (the cumulative length).

The figure shows that the failure rates for water and multiphase lines are the highest, and for water lines the rate appears abnormally high. More importantly it shows that the annual rates remain relatively constant, even though the systems are growing and aging.

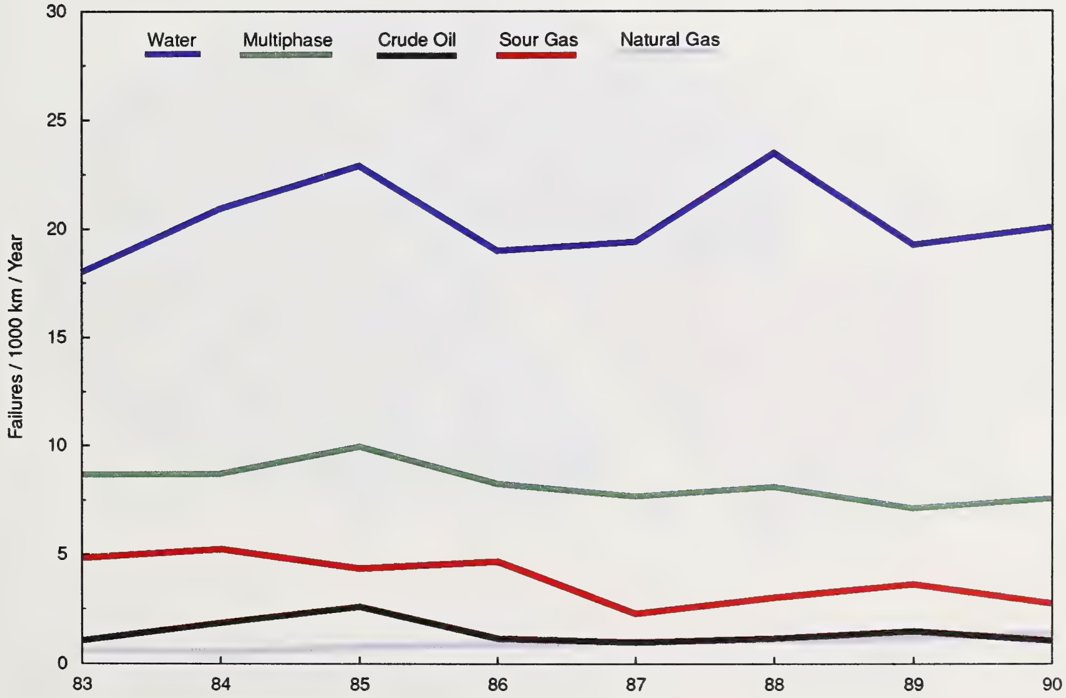


FIGURE 12 FAILURE FREQUENCY
Based on Cumulative Pipeline Length and Annual Failures

6 Leaks and Ruptures

Figure 13 shows that over 80 per cent of failures are leaks and less than 20 per cent ruptures.

- A **leak** is defined as a small opening, crack, or hole in the pipeline causing some product loss but not immediately impairing the operation of the line.
- A **rupture** is the instantaneous tearing or fracturing of the pipe material causing immediate impairment of the operation of the pipeline.

The data show that most leaks are corrosion related and that a significant number of the ruptures are caused by third-party damage.

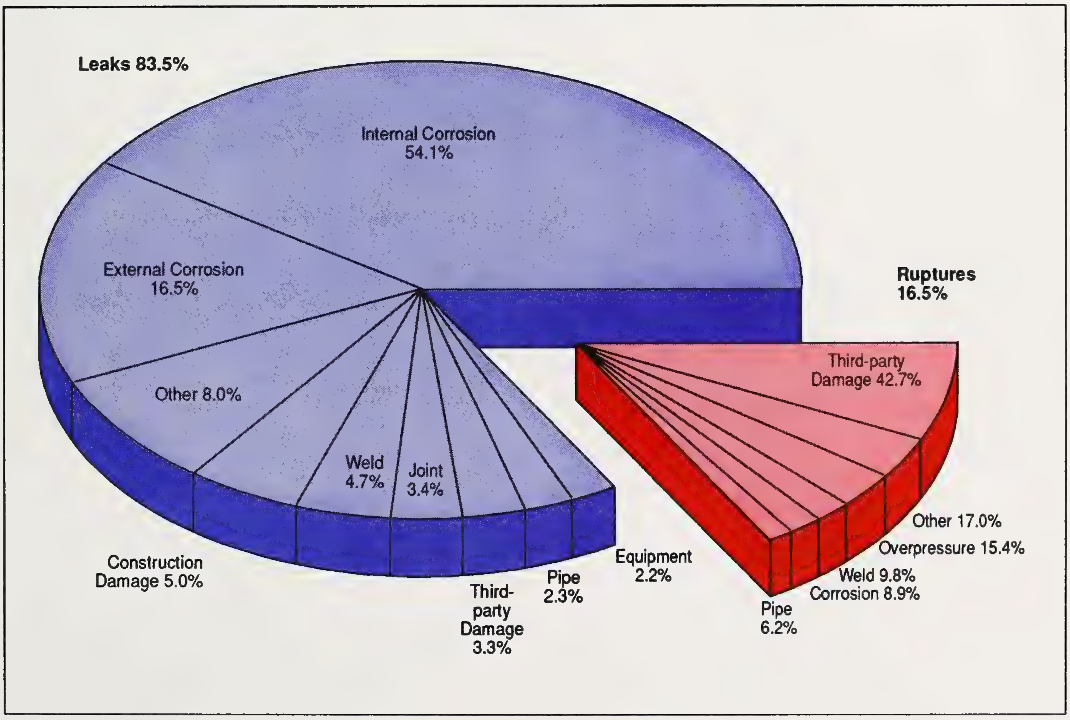


FIGURE 13 CAUSES OF PIPELINE LEAKS AND RUPTURES (Per Cent)

7 Volumes Spilled

The analysis of volumes spilled is very approximate, because of the way the volumes are reported. The volumes are usually on-the-spot estimates, either by the Board inspector or company personnel. The distribution of liquid spill volumes over the last 11 years is shown in Table 4 and shows that the majority of spills are less than 5 m^3.

TABLE 4 DISTRIBUTION OF VOLUMES OF LIQUID SPILLS (per cent)

Volume (m^3)	Water	Multiphase	Crude Oil
>1	30	38	42
1 ≤ 5	23	36	22
5 ≤ 10	12	8	7
10 ≤ 50	22	12	14
50 ≤ 100	7	3	6
100 ≤ 500	4	2	5
500 ≤ 1000	1	(0.3)	2
> 1000	1	0	1

8 Relationship Between Cause of Failure and Pipe Diameter

The failure data were explored to address the conjecture that there may be a relationship between pipeline diameter and cause of failure.

Figures 14 and 15 give the distribution of failures by diameter for natural gas and crude oil pipelines, these two categories accounting for the majority of pipelines and having the greatest range of diameters. Pipelines with diameters less than 150 mm account for approximately 70 per cent of the total network of pipelines and consequently will account for the majority of failures.

There does not appear to be any significant relationship between cause and diameter.

If might be expected that smaller diameter gas pipelines would have a greater proportion of internal corrosion failures, because they are usually involved with the more aggressive fluids, but the proportions do not vary significantly with diameter. The proportion of equipment failure is higher on the larger diameter lines, particularly on oil lines.

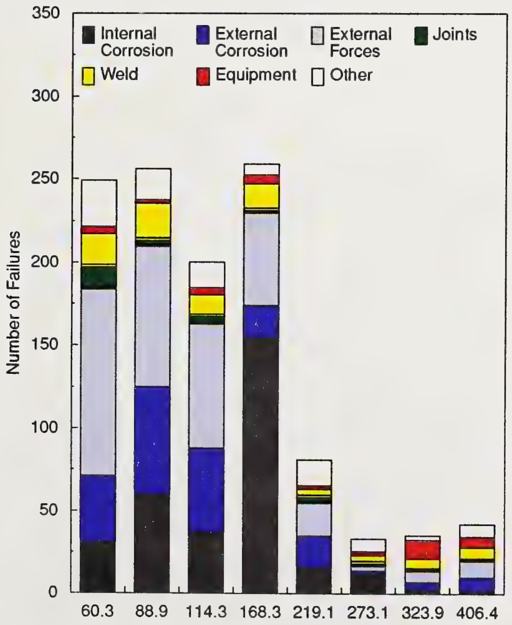


FIGURE 14 NATURAL GAS FAILURES BY DIAMETER
By Cause

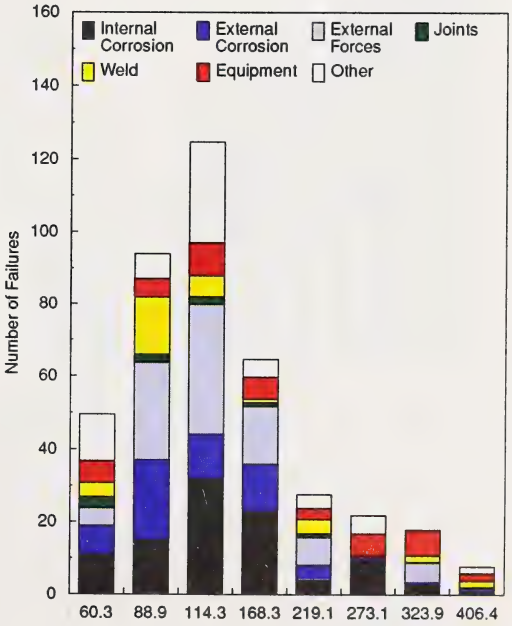


FIGURE 15 CRUDE OIL FAILURES BY DIAMETER
By Cause

PART B

SALT WATER PIPELINES

INTRODUCTION

In the last 11 years fresh and salt water (water) pipelines have accounted for 42 per cent of all pipeline failures. The number of water pipeline failures has been increasing over the years, specifically those due to internal corrosion. There are three times as many salt water pipeline failures than fresh water pipeline failures because of the corrosive nature of the salt water. The ERCB is concerned with these increases because of the environmental damage that may be caused by a salt water line failure. Spilled salt water may have a seriously detrimental effect on vegetation and also on aquatic life if it migrates into streams and lakes. Since salt water pipeline failures are more prevalent than fresh water failures, and more damaging to the environment, this section will deal specifically with salt water pipeline failures.

1 Review of Failures

Salt water is produced along with oil and gas and must be disposed of. Salt water can be disposed of by injecting it down an ERCB-approved disposal well. In the last 10 years it has been used in enhanced oil recovery (EOR) schemes. More salt water is being produced as the wells get older; therefore, the volume of salt water to dispose of is increasing. Today large volumes of salt water are being injected into oil and gas reservoirs to maintain or enhance oil recovery levels. Higher than normal operating pressures are required for EOR salt water pipelines and large volumes of water are injected; therefore, these salt water pipelines have a greater likelihood of internal corrosion problems.

Figure 16 shows the annual distribution of causes of salt water pipeline failure from 1980 to 1990 and demonstrates that failures due to internal corrosion have increased dramatically since 1980.

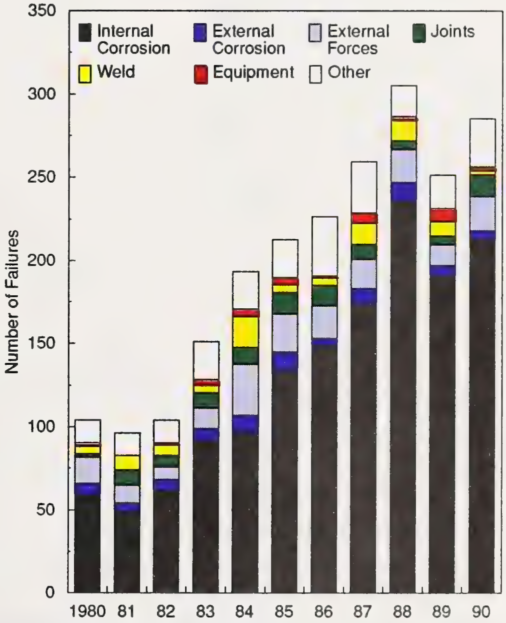


FIGURE 16 ANNUAL SALT WATER PIPELINE FAILURES By Cause

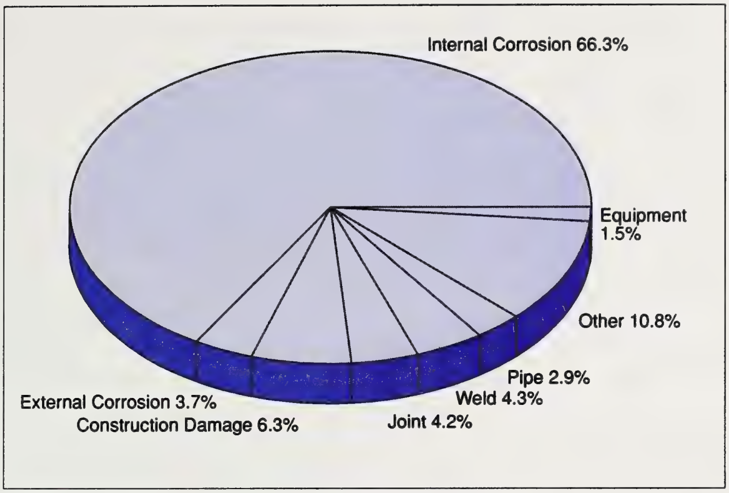


FIGURE 17 CAUSES OF SALT WATER PIPELINE FAILURES (Per Cent)

Figure 17 details the cumulative distribution of the causes of salt water pipeline failures, and shows that internal corrosion is by far the major cause of water line failures. Construction damage failures are more frequent on water lines than on other types of lines, perhaps because of the use of cement-lined and thin film coated pipe in water lines, which require care during installation to ensure the integrity of the internal coating. Failures due to construction damage usually occur in the early years after construction. The failures in later years are most often due to corrosion.

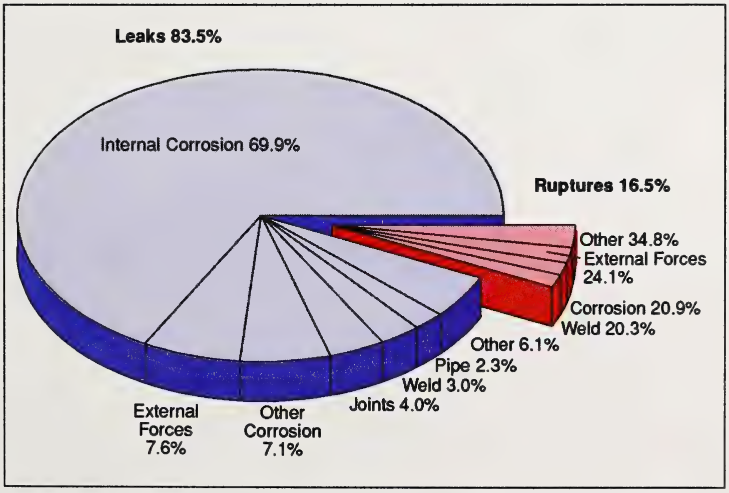


FIGURE 18 CAUSES OF SALT WATER PIPELINE LEAKS AND RUPTURES (Per Cent)

Figure 18 details the causes of leaks and ruptures in salt water lines. The major causes of ruptures are external forces, corrosion, and weld failures. Seam weld failures accounted for 75 per cent of the ruptures caused by weld failures. Included in the other category are pipeline body and overpressure failures which account for 21 per cent of the ruptures. Internal corrosion accounted for 93 per cent of the ruptures caused by corrosion.

Most salt water pipeline failures are leaks due to internal corrosion.

The average volume spilled in salt water pipeline failures is less than 100 m^3; the majority of failures result in spills of less than 10 m^3. The majority of the large volume spills occur on pipelines used for EOR schemes. This does not imply a relationship between volumes transported and failure probability, and no such trend was found. However, since EOR pipelines generally transport a large volume of salt water, if they fail there is a good chance that the volume of salt water spilled might be large. The injection and disposal volumes were reviewed to see if there was a trend between failures and volumes injected or disposed of; no definite trend was found.

2 Commentary

Methods available to prevent internal corrosion include chemical inhibition and physical separation of the fluid from the pipe wall. Cement and epoxy linings have been used to achieve the latter. A fairly recent development which shows some promise is the use of polyethylene liners in both new and old pipe. Non-metallic pipes, such as fibreglass-reinforced epoxy-resin pipes, have been used in certain applications with some success.

Given the highly corrosive (and erosive) nature of the product, the high pressures, and high volumes transported, it is virtually impossible to avoid failures in salt water pipelines. Therefore it is important to reduce the volumes spilled. This implies early detection and immediate action to control the spill volume. Continuing improvements in leak detection capabilities lead the Board to believe that it is feasible, although difficult, to apply leak detection capabilities to a salt water injection system.

PART C

CONCLUSIONS

Although the failure rates are generally remaining constant the Board is concerned about the relatively high failure rates of salt water and multiphase lines, and the increasing number of failures caused by internal corrosion. It has therefore initiated changes to the Pipeline Regulation to require periodic inspections or tests to determine the effectiveness of corrosion mitigation procedures. The Board has also changed its inspection priorities to focus more on corrosion monitoring and control.

The development of internal polyethylene liners has prompted additions to the relevant Canadian Standards Association standards, in particular CAN/CSA-Z183-M90.

The Board will continue to monitor failure causes closely to determine if the steps it has taken are effective, and also to facilitate early detection of any pipeline-aging effects. The continuing improvements in leak detection capabilities lead the Board to believe, given that a number of failures are inevitable, the volumes spilled can be more closely controlled and that the multi-thousand cubic metre spill should be a thing of the past.

Presentation of these failure statistics invites comparison with those from other jurisdictions. The Board cautions that comparison is difficult because of the variety of reporting conditions to be found in other jurisdictions. In some cases a minimum volume of spill is used as a reporting criteria, thus eliminating the reporting of many of the small leaks caused by pinhole corrosion. In others, reporting is limited to transmission lines, thus eliminating information on gathering systems. This publication deals with all pipelines from wellhead to end-use or points of export from Alberta and all releases irrespective of volume.

The Board would be interested in any comments which could lead to an improvement in the content of the report. Such comments should be directed to the ERCB Pipeline Department.

APPENDIX A

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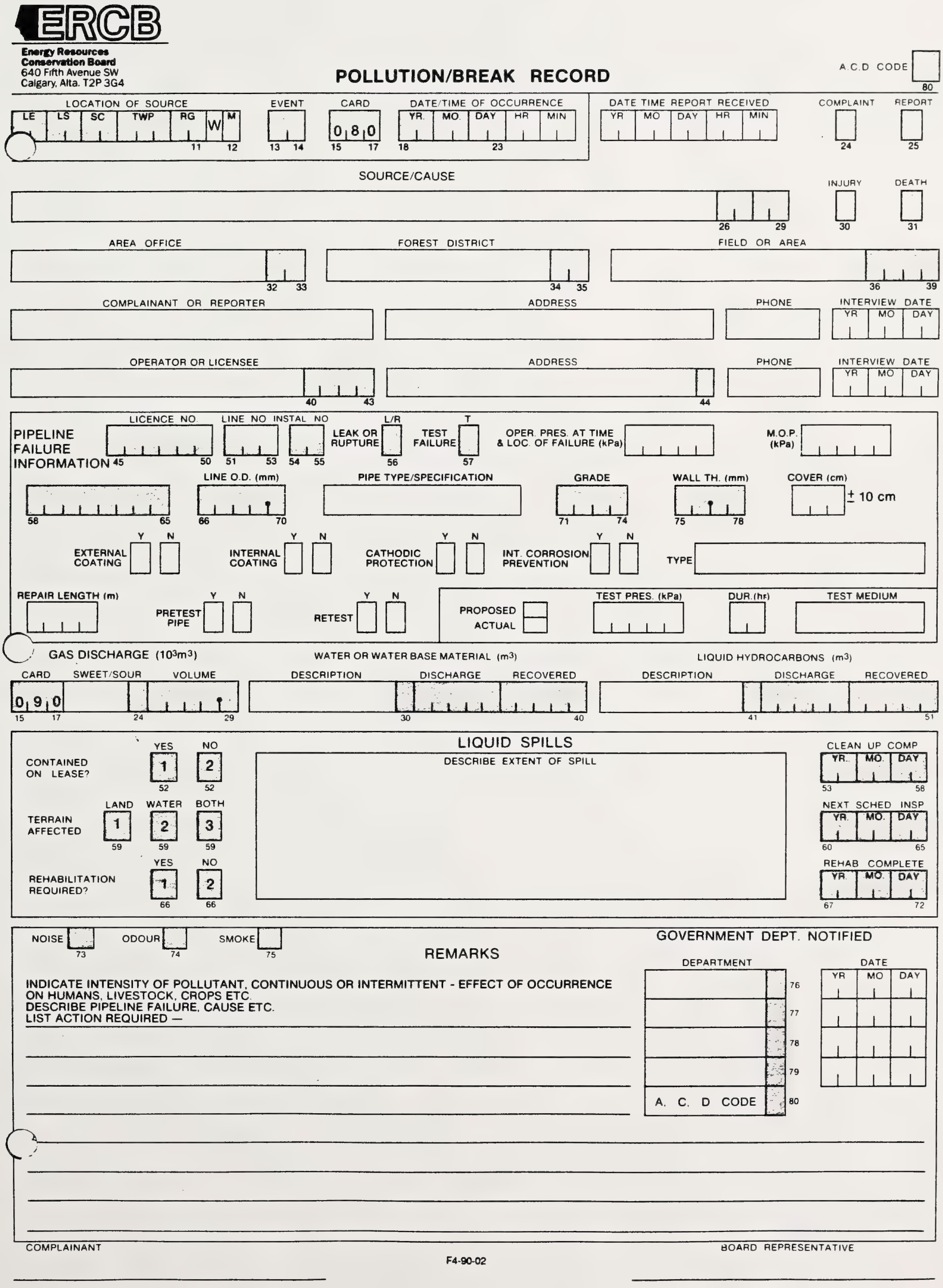

ERCB

Energy Resources
Conservation Board
640 Fifth Avenue SW
Calgary, Alta. T2P 3G4

POLLUTION/BREAK RECORD

A.C.D CODE ☐ 80

LOCATION OF SOURCE: LE | LS | SC | TWP | RG | W | M (11, 12)
EVENT (13 14)
CARD 0 8 0 (15 17)
DATE/TIME OF OCCURRENCE: YR. | MO. | DAY | HR | MIN (18 23)
DATE TIME REPORT RECEIVED: YR | MO | DAY | HR | MIN
COMPLAINT ☐ 24
REPORT ☐ 25

SOURCE/CAUSE (26 29)
INJURY ☐ 30
DEATH ☐ 31

AREA OFFICE (32 33)
FOREST DISTRICT (34 35)
FIELD OR AREA (36 39)

COMPLAINANT OR REPORTER
ADDRESS
PHONE
INTERVIEW DATE: YR | MO | DAY

OPERATOR OR LICENSEE (40 43)
ADDRESS (44)
PHONE
INTERVIEW DATE: YR | MO | DAY

PIPELINE FAILURE INFORMATION
LICENCE NO. (45 50)
LINE NO (51 53)
INSTAL NO (54 55)
L/R LEAK OR RUPTURE ☐ 56
T TEST FAILURE ☐ 57
OPER. PRES. AT TIME & LOC. OF FAILURE (kPa)
M.O.P. (kPa)
(58 65)
LINE O.D. (mm) (66 70)
PIPE TYPE/SPECIFICATION
GRADE (71 74)
WALL TH. (mm) (75 78)
COVER (cm) ± 10 cm

EXTERNAL COATING Y ☐ N ☐
INTERNAL COATING Y ☐ N ☐
CATHODIC PROTECTION Y ☐ N ☐
INT. CORROSION PREVENTION Y ☐ N ☐
TYPE

REPAIR LENGTH (m)
PRETEST PIPE Y ☐ N ☐
RETEST Y ☐ N ☐
PROPOSED ☐
ACTUAL ☐
TEST PRES. (kPa)
DUR.(hr)
TEST MEDIUM

GAS DISCHARGE (10^3m^3)
CARD 0 9 0 (15 17)
SWEET/SOUR (24)
VOLUME (29)

WATER OR WATER BASE MATERIAL (m^3)
DESCRIPTION (30)
DISCHARGE
RECOVERED (40)

LIQUID HYDROCARBONS (m^3)
DESCRIPTION (41)
DISCHARGE
RECOVERED (51)

LIQUID SPILLS

CONTAINED ON LEASE? YES 1 (52) NO 2 (52)
TERRAIN AFFECTED: LAND 1 (59) WATER 2 (59) BOTH 3 (59)
REHABILITATION REQUIRED? YES 1 (66) NO 2 (66)

DESCRIBE EXTENT OF SPILL

CLEAN UP COMP: YR. | MO. | DAY (53 58)
NEXT SCHED INSP: YR. | MO. | DAY (60 65)
REHAB COMPLETE: YR. | MO. | DAY (67 72)

NOISE ☐ 73
ODOUR ☐ 74
SMOKE ☐ 75

REMARKS

INDICATE INTENSITY OF POLLUTANT, CONTINUOUS OR INTERMITTENT - EFFECT OF OCCURRENCE ON HUMANS, LIVESTOCK, CROPS ETC.
DESCRIBE PIPELINE FAILURE, CAUSE ETC.
LIST ACTION REQUIRED —

GOVERNMENT DEPT. NOTIFIED

DEPARTMENT		DATE YR	MO	DAY
	76			
	77			
	78			
	79			
A. C. D CODE	80			

COMPLAINANT

BOARD REPRESENTATIVE

F4-90-02

N.L.C. - B.N.C.
3 3286 11301137 9